DICOM Conformance Statement

Product Name: ACUSON Freestyle Ultrasound System
Release: VA30A
Date: June 2013

www.siemens.com/DICOM

SIEMENS

1 CONFORMANCE STATEMENT OVERVIEW

The **ACUSON Freestyle™ Ultrasound System** supports the following DICOM Application Entities:

- Verification
  - Verification AE
- Transfer
  - Storage AE
  - Storage Commitment AE
- Query / Retrieve
  - Query AE
  - Retrieve AE
- Workflow Management
  - Worklist AE

Table 1-1:
Network Services

SOP Classes	Service Class User (SCU)	Service Class Provider (SCP)
VERIFICATION		
Verification AE		
Verification	Yes	Yes
TRANSFER		
Storage AE		
Ultrasound Image Storage	Yes	No
Ultrasound Multi-frame Image Storage	Yes	No
Storage Commitment AE		
Storage Commitment Push Model	Yes	No
WORKFLOW MANAGEMENT		
Worklist AE		
Modality Worklist	Yes	No

Table 1-2:
UID Values

SOP Class Name	SOP Class UID	Category
Verification AE		
Verification	1.2.840.10008.1.1	Verification
Storage AE		
Ultrasound Image Storage	1.2.840.10008.5.1.4.1.1.6.1	Transfer
Ultrasound Multi-frame Image Storage	1.2.840.10008.5.1.4.1.1.3.1	Transfer
Storage Commitment AE		
Storage Commitment Push Model	1.2.840.10008.1.20.1	Transfer
Worklist AE		
Modality Worklist	1.2.840.10008.5.1.4.31	Workflow Management

Table 1-3:
Media Services

Media Storage Application Profile	Write Files (FSC or FSU)	Read Files (FSR)
General Purpose USB Media Interchange with JPEG		
STD-GEN-USB-JPEG	Yes	No

2 TABLE OF CONTENTS

1 CONFORMANCE STATEMENT OVERVIEW 2
2 TABLE OF CONTENTS 4
3 INTRODUCTION 7
3.1 Audience 7
3.2 Remarks 7
3.3 Terms and Definitions 8
3.4 Basics of DICOM Communication 10
3.5 Abbreviations 11
3.6 References 11
4 IMPLEMENTATION MODEL 11
4.1 Application Data Flow Diagrams 12
4.1.1 Verification 13
4.1.2 Image Export 13
4.1.3 Storage Commitment 13
4.1.4 Modality Worklist 14
4.1.5 Removable Media Storage 16
4.2 AE Functional Descriptions 16
4.2.1 Verification Real-World Activities 16
4.2.2 Store Real-World Activities 16
4.2.3 Storage Commitment Real-World Activities 16
4.2.4 Modality Worklist Real-World Activites 16
4.2.5 Removable Media Storage Real-World Activities 16
5 AE SPECIFICATIONS 17
5.1 ACUSON Freestyle AE Specification 17
5.1.1 Association Establishment Policies 17
5.1.1.1 General 17
5.1.1.2 Association Establishment Order 17
5.1.1.3 Asynchronous Nature 17
5.1.1.4 Implementation Identifying Information 17
5.1.2 Association Initiation by Real-World Activities 17
5.1.2.1 Real World Activity – Verification 17
5.1.2.2 Real World Activity – Store 18
5.1.2.3 Real-World Activity – Storage Commitment 24
5.1.2.4 Real World Activity – Modality Worklist 25
6 REMOVABLE INTERCHANGE MEDIA SPECIFICATIONS 29
6.1 Supported SOP Classes 29
6.2 Proposed Interchange Media Transfer Syntaxes 29
6.3 Physical Storage Media and Format 29
7 COMMUNICATION PROFILES 30
7.1 TCP/IP Stack Supported 30

7.1.1 Physical Media Supported 30
8 EXTENSIONS/SPECIALIZATIONS/PRIVATIZATIONS 30
9 CONFIGURATION 30
9.1 Network Identification 30
9.2 Freestyle DICOM Information 31
9.3 DICOM PACS Information 31
9.4 DICOM Storage Commitment Server Information 31
9.5 Modality Worklist Server Information 31
9.6 Support of Extended Character Sets 32

LIST OF TABLES

Table 1-1: Network Services 2
Table 1-2: UID Values 2
Table 1-3: Media Services 3
Table 4-1: Displayed Worklist Return Values 15
Table 4-2: Freestyle New Patient Screen Parameters Populated From Worklist Return Values 15
Table 5-1: Supported SOP Classes 17
Table 5-2: Verification Presentation Context 18
Table 5-3: Store Presentation Context 18
Table 5-4: Supported Storage Service SOP Classes 18
Table 5-5: US Image IOD Attributes 19
Table 5-6: Ultrasound Multi-Frame Image IOD Attributes 21
Table 5-7: Storage Commitment Request Presentation Context 24
Table 5-8: Supported Storage Commitment SOP Classes 24
Table 5-9: Storage Commitment Request Attributes 25
Table 5-10: Storage Commitment Response Attributes 25
Table 5-11: Modality Worklist Presentation Context 25
Table 5-12: Supported Modality Worklist SOP Classes 26
Table 5-13: Modality Worklist Query Attributes 26
Table 6-1: Supported Media Storage SOP Classes 29
Table 6-2: Proposed Transfer Syntaxes for Interchange Media 29

LIST OF FIGURES

Figure 4-1. Implementation Model 12
Figure 4-2. Verification Model 13
Figure 4-3. Store Model 13
Figure 4-4. Storage Commitment Model 14
Figure 4-5. Modality Worklist Model 15

3 INTRODUCTION

This document describes the conformance to the ACR-NEMA DICOM 3.0 Standard by the ACUSON Freestyle ™ ultrasound system, version VA30A from Siemens Healthcare. It shall establish the conformance specifications for this system only, and does not apply to other products offered by Siemens Healthcare or its affiliates.

The ACUSON Freestyle system is a device that generates ultrasound images that can be sent using DICOM standard protocols and definitions to other DICOM compliant devices that support the SOP classes defined in Table 5-1.

This document is written with respect to the adopted portions of the DICOM standard, Version 3. The following sections of this document follow the outline specified in the DICOM Standard NEMA publication PS3.2.[1]

3.1 Audience

This document is written for the people that need to understand how the ACUSON Freestyle system will integrate into their healthcare facility. This includes both those responsible for overall imaging network policy and architecture, as well as integrators who need to have a detailed understanding of the DICOM features of the product. This document contains some basic DICOM definitions so that any reader may understand how this product implements DICOM features. However, integrators are expected to fully understand all the DICOM terminology, how the tables in this document relate to the product's functionality, and how that functionality integrates with other devices that support compatible DICOM features.

3.2 Remarks

The scope of this DICOM Conformance Statement is to facilitate integration between the ACUSON Freestyle system and other DICOM products. The Conformance Statement should be read and understood in conjunction with the DICOM Standard.

DICOM, by itself, does not guarantee interoperability. However, the Conformance Statement facilitates a first-level validation for interoperability between different applications supporting the same DICOM functionality as SCU and SCP, respectively.

This Conformance Statement is not intended to replace validation with other DICOM equipment to ensure proper exchange of information intended.

The scope of this Conformance Statement is to facilitate communication with Siemens and other vendors' Medical equipment. The Conformance Statement should be read and understood in conjunction with the DICOM 3.0 Standard [1]. However, by itself it is not guaranteed to ensure the desired interoperability and a successful interconnectivity.

The user should be aware of the following important issues:

- The comparison of different conformance statements is the first step towards assessing interconnectivity.
- Test procedures should be defined and tests should be performed by the user to validate the connectivity desired. DICOM itself and the conformance parts do not specify this.

[1] Source: DICOM® Standards Publication Part 2, © NEMA. The DICOM Standard is under continuous maintenance. The current official version is available at http://dicom.nema.org.

- The standard will evolve to meet the users' future requirements. Siemens is actively involved in developing the standard further and therefore reserves the right to make changes to its products or to discontinue its delivery.

Siemens reserves the right to modify the design and specifications contained herein without prior notice. Please contact your local Siemens representative for the most recent product information.

3.3 Terms and Definitions

Informal definitions are provided for the following terms used in this Conformance Statement. The DICOM Standard is the authoritative source for formal definition of these terms.

Abstract Syntax – The information agreed to be exchanged between applications, generally equivalent to a Service/Object Pair (SOP) Class. Examples: Verification SOP Class, Modality Worklist Information Model Find SOP Class, Computed Radiography Image Storage SOP Class.

ACUSON Freestyle™ system – The ultrasound system of this conformance statement; also referred to as Freestyle.

Application Entity (AE) – An end point of a DICOM information exchange, including the DICOM network or media interface software; i.e., the software that sends or receives DICOM information objects or messages. A single device may have multiple Application Entities.

Application Entity Title – The externally known name of an *Application Entity*, used to identify a DICOM application to other DICOM applications on the network.

Application Context – The specification of the type of communication used between *Application Entities*. Example: DICOM network protocol.

Association – A network communication channel set up between *Application Entities*.

Attribute – A unit of information in an object definition; a data element identified by a *tag*. The information may be a complex data structure (Sequence), itself composed of lower level data elements. Examples: Patient ID (0010,0020), Accession Number (0008,0050), Photometric Interpretation (0028,0004), Procedure Code Sequence (0008,1032).

Attribute Macro - A set of Attributes that are described in a single table that is referenced by multiple Module or other tables.

Information Object Definition (IOD) – A data abstraction of a class of similar Real-World Objects which defines the nature and attributes relevant to the class of Real-World objects represented. Examples: MR Image IOD, CT Image IOD, Print Job IOD.

Integrating the Healthcare Enterprise (IHE) – An initiative sponsored by the Radiological Society of North America (RSNA) to document and demonstrate standards-based methods of sharing information in support of optimal patient care. For additional information, see www.rsna.org/ihe.

Functional Group - A set of logically related Attributes that are likely to vary together. May be used in Multi-frame IODs to describe parameters which change on a per frame basis.

Joint Photographic Experts Group (JPEG) – Joint Photographic Experts Group, The group was organized in 1986, issuing a standard in 1992, which was approved in 1994 as ISO 10918-1. The JPEG standard is used by DICOM applications.

Media Application Profile – The specification of DICOM information objects and encoding exchanged on removable media (e.g., CDs), see DICOM PS3.11.

Module – A set of *Attributes* within an *Information Object Definition* that are logically related to each other. Example: Patient Module includes (among others) Patient Name, Patient ID, Patient Birth Date, and Patient Sex.

Negotiation – First phase of *Association* establishment that allows *Application Entities* to agree on the types of data to be exchanged and how that data will be encoded.

Picture Archiving and Communications Systems (PACS) – A DICOM server that accepts medical images from another DICOM system and stores the images for later retrieval.

Presentation Context – The set of DICOM network services used over an *Association*, as negotiated between *Application Entities*; includes *Abstract Syntaxes* and *Transfer Syntaxes*.

Protocol Data Unit (PDU) – A packet (piece) of a DICOM message sent across the network. It contains protocol control information and user data. Devices must specify the maximum size packet they can receive for DICOM messages.

Request (RQ) – A request from one DICOM AE for service from another DICOM AE.

Response (RSP) – A response from one DICOM AE to the request for service from another DICOM AE.

Security Profile – A set of mechanisms, such as encryption, user authentication, or digital signatures, used by an *Application Entity* to ensure confidentiality, integrity, and/or availability of exchanged DICOM data.

Service Class Provider (SCP) – The role of an *Application Entity* that provides a DICOM network service; typically, a server that performs operations requested by another *Application Entity* (*Service Class User*). Examples: Picture Archiving and Communication System (image storage SCP, and image query/retrieve SCP), Radiology Information System (modality worklist SCP).

Service Class User (SCU) – The role of an *Application Entity* that uses a DICOM network service; typically, a client. Examples: imaging modality (image storage SCU, and modality worklist SCU), imaging workstation (image query/retrieve SCU).

Service/Object Pair (SOP) Class – The specification of the network or media transfer (service) of a particular type of data (object); the fundamental unit of DICOM interoperability specification. Examples: Ultrasound Image Storage Service, Basic Grayscale Print Management.

Service/Object Pair (SOP) Instance – An information object; a specific occurrence of information exchanged in a *SOP Class*. Examples: a specific x-ray image.

Tag – A 32-bit identifier for a data element, represented as a pair of four digit hexadecimal numbers, the “group” and the “element”. If the “group” number is odd, the tag is for a private (manufacturer-specific) data element. Examples: (0010,0020) [Patient ID], (07FE,0010) [Pixel Data], (0019,0210) [private data element].

Transfer Syntax – The encoding used for exchange of DICOM information objects and messages. Examples: *JPEG* compressed (images), little endian explicit value representation.

Unique Identifier (UID) – A globally unique “dotted decimal” string that identifies a specific object or a class of objects; an ISO-8824 Object Identifier. Examples: Study Instance UID, SOP Class UID, SOP Instance UID.

Value Representation (VR) – The format type of an individual DICOM data element, such as text, an integer, a person's name, or a code. DICOM information objects can be transmitted with either explicit identification of the type of each data element (Explicit VR), or without explicit identification (Implicit VR); with Implicit VR, the receiving application must use a DICOM data dictionary to look up the format of each data element.

3.4 Basics of DICOM Communication

This section describes terminology used in this Conformance Statement for the non-specialist. The key terms used in the Conformance Statement are highlighted in *italics* below. This section is not a substitute for training about DICOM, and it makes many simplifications about the meanings of DICOM terms.

Two *Application Entities* (devices) that want to communicate with each other over a network using DICOM protocol must first agree on several things during an initial network "handshake". One of the two devices must initiate an *Association* (a connection to the other device), and ask if specific services, information, and encoding can be supported by the other device (*Negotiation*).

DICOM specifies a number of network services and types of information objects, each of which is called an *Abstract Syntax* for the Negotiation. DICOM also specifies a variety of methods for encoding data, denoted *Transfer Syntaxes*. The Negotiation allows the initiating Application Entity to propose combinations of Abstract Syntax and Transfer Syntax to be used on the Association; these combinations are called *Presentation Contexts.* The receiving Application Entity accepts the Presentation Contexts it supports.

For each Presentation Context, the Association Negotiation also allows the devices to agree on *Roles* – which one is the *Service Class User* (SCU - client) and which is the *Service Class Provider* (SCP - server). Normally the device initiating the connection is the SCU, i.e., the client system calls the server, but not always.

The Association Negotiation finally enables exchange of maximum network packet (*PDU*) size, security information, and network service options (called *Extended Negotiation* information).

The Application Entities, having negotiated the Association parameters, may now commence exchanging data. Common data exchanges include queries for worklists and lists of stored images, transfer of image objects and analyses (structured reports), and sending images to film printers. Each exchangeable unit of data is formatted by the sender in accordance with the appropriate *Information Object Definition*, and sent using the negotiated Transfer Syntax. There is a Default Transfer Syntax that all systems must accept, but it may not be the most efficient for some use cases. Each transfer is explicitly acknowledged by the receiver with a *Response Status* indicating success, failure, or that query or retrieve operations are still in process.

Two Application Entities may also communicate with each other by exchanging media (such as a CD-R). Since there is no Association Negotiation possible, they both use a *Media Application Profile* that specifies "pre-negotiated" exchange media format, Abstract Syntax, and Transfer Syntax.

3.5 Abbreviations

ACR	American College of Radiology
AE	DICOM Application Entity
AET	DICOM Application Entity Title
ASCII	American Standard Code for Information Interchange
DB	Database
DCS	DICOM Conformance Statement
DIMSE	DICOM Message Service Element
FSC	Interchange Media File Set Creator
FSU	Interchange Media File Set Updater
HIS	Hospital Information System
ILE	Implicit Little Endian transfer syntax
IOD	DICOM Information Object Definition
MWL	Modality Worklist
NEMA	National Electrical Manufacturers Association
PACS	Picture Archiving and Communications Systems
PDU	DICOM Protocol Data Unit
RIS	Radiology Information System
RWA	Real-World Activity
SC	Storage Commitment
SCP	DICOM Service Class Provider (DICOM server)
SCU	DICOM Service Class User (DICOM client)
SOP	DICOM Service-Object Pair
UID	Unique identifier
US	Ultrasound

3.6 References

[1] DICOM® Standards Publication, PS 3.1 – PS 3.18, © NEMA. The DICOM Standard is under continuous maintenance. The current official version is available at http://dicom.nema.org.

4 IMPLEMENTATION MODEL

All Freestyle systems can export studies in DICOM format to a networked DICOM device and to a USB flash drive. Studies exported to a USB flash drive also include the DICOM directory file (dicomdir).

Images can be transferred from the Freestyle to DICOM workstations and archive servers on a network. Storage Commitment can be used to insure that patient images and data are safely committed on a PACS. The system can query a HIS/RIS, using DICOM Modality Worklist, for a list of scheduled patient procedures.

ACUSON Freestyle system real world activities are indicated by “Real World Activity” name while “Freestyle AE” indicates the invoked Application Entity. Similarly, the activities associated with service providers are indicated as “Real World Service Activity.”

4.1 Application Data Flow Diagrams

Figure 4-1 illustrates the ACUSON Freestyle system’s Application Entity (AE), which is shown in the box. Relationships between user invoked activities (in the circles at the left of the AE) and the associated real-world activities provided by DICOM service providers (in the circles on the right side of the diagram) are shown.

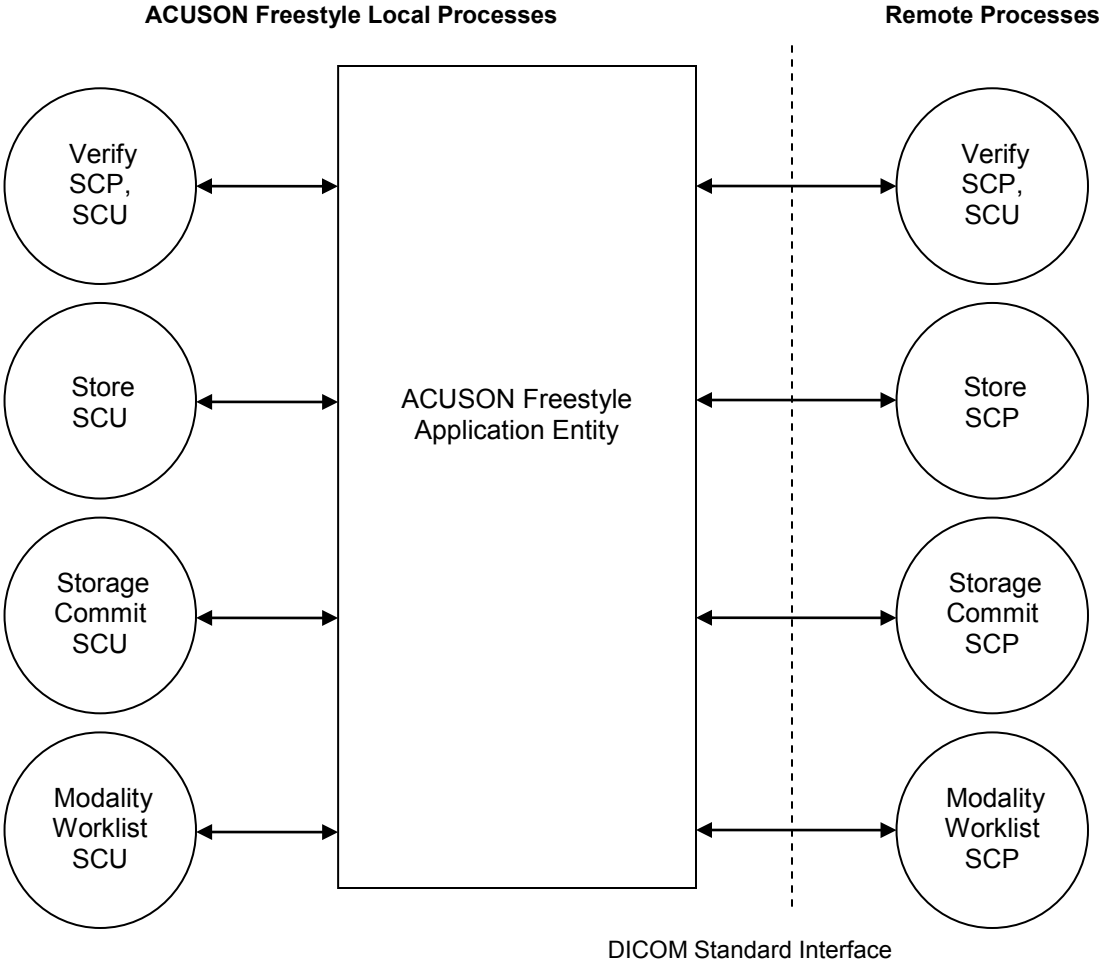

Figure 4-1. Implementation Model

4.1.1 Verification

Verification is available in the DICOM PACS, DICOM Storage Commitment and DICOM Worklist settings pages. Verification can be used to send a DICOM verification request (C-ECHO) to a remote Application Entity (AE) and will listen for a response. Verification on the Freestyle can be performed as an SCU or an SCP.

When the Verification SCU is invoked, the following messages are returned to the user:

- DICOM C-ECHO successful
- Could not establish association
- DICOM C-ECHO timed out

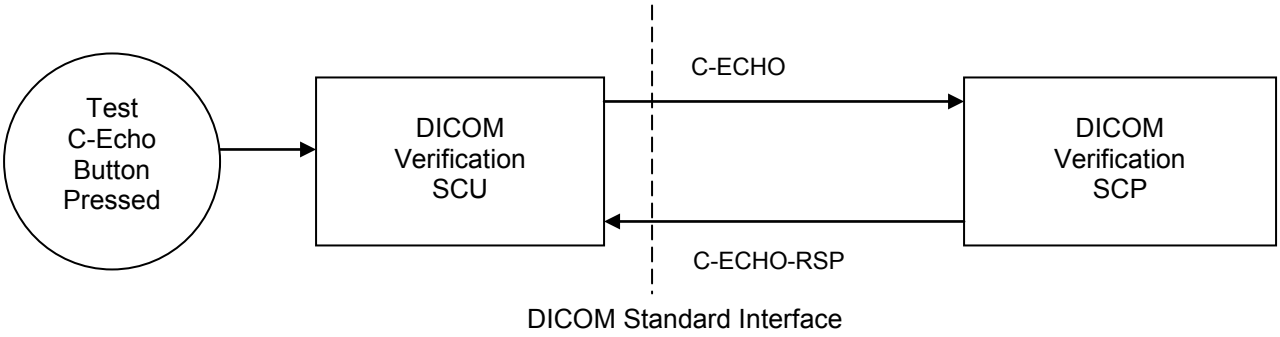

Figure 4-2. Verification Model

4.1.2 Image Export

Image Export allows the user to export Freestyle single frame and multi-frame ultrasound images to a networked DICOM archive server, which supports the Storage service class as an SCP. The Freestyle system acts as SCU for the C-STORE DICOM network service. The storage operation is initiated from the Freestyle Study List Page.

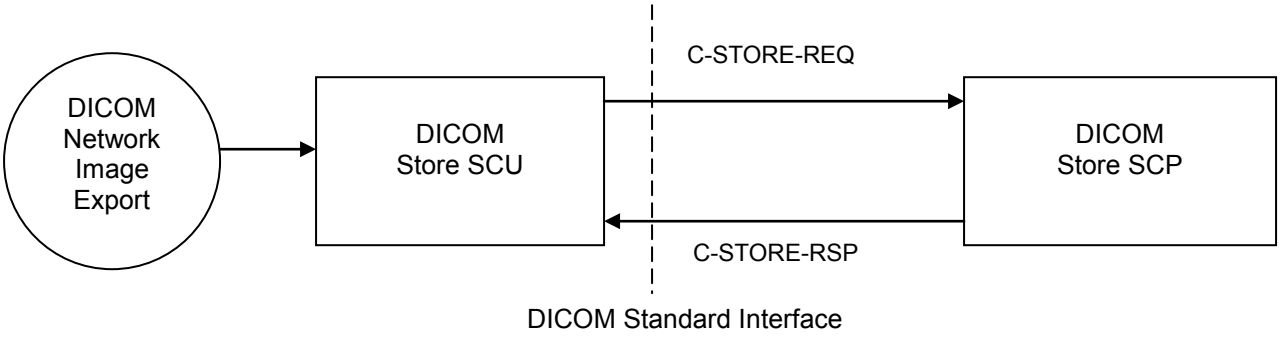

Figure 4-3. Store Model

4.1.3 Storage Commitment

In order for the Freestyle to send the Storage Commitment message, at least one Storage Commitment server must be configured in the system and the a Server must be selected in the Storage Commitment Destination combo box on the Export Dialog.

DICOM Storage Commitment is embedded in the successful completion of a study store to a DICOM Store SCP. It is negotiated after all images have been successfully stored to a DICOM Store SCP.

Freestyle uses the DICOM Storage Commitment Push Model to inform the server when all stores for a study have been completed. The Storage Commitment SCU uses the N-ACTION primitive to make a request to the SCP for safekeeping of a set of SOP instances (eg: Ultrasound images).

The Freestyle Storage Commitment SCU also performs a role reversal and becomes the SCP for the N-EVENT-REPORT primitives received from the original SCP (now an SCU).

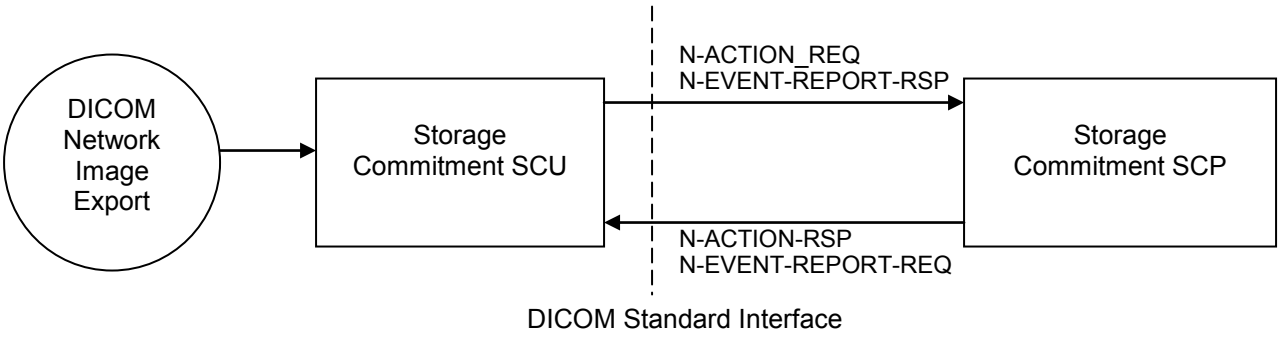

Figure 4-4. Storage Commitment Model

4.1.4 Modality Worklist

Patient registration can be automated by using the 'Worklist' Real World Activity. Pressing the 'New Patient Study' menu item displays the patient information entry page. Pressing the 'Worklist' button on this page invokes the Worklist Query screen. The ‘Worklist’ button will only be visible if one or more Worklist servers are configured in the system,

Clicking on the 'Query' button will attempt to find all matching patients using the information from the Worklist Query portion of the screen.

Once a Worklist query is initiated, the Query Status field will be updated to indicate “In Progress”. The user has the option to press the Cancel button, which will abort the query operation.

Patient name fields that are partially filled or empty will be treated as though an implicit wildcard was appended at the end of each field. ID and Accession number will be exact match only.

If no matches are found, the Query Status field will be updated to indicate that 0 responses were received. If more that one matching patient is found, a pick list of patient exams will be displayed to the user. Each of the fields can be sorted in ascending and descending order. The list will be limited to a number of preset entries. If more than this number of matching records are found in the query, the search will terminate and a the user will be notified. The search criteria contains:

- Patient Name (Last, First)
- Patient ID
- Accession Number
- Gender
- Exam Start Date Range
- Ultrasound (US) or All Modality

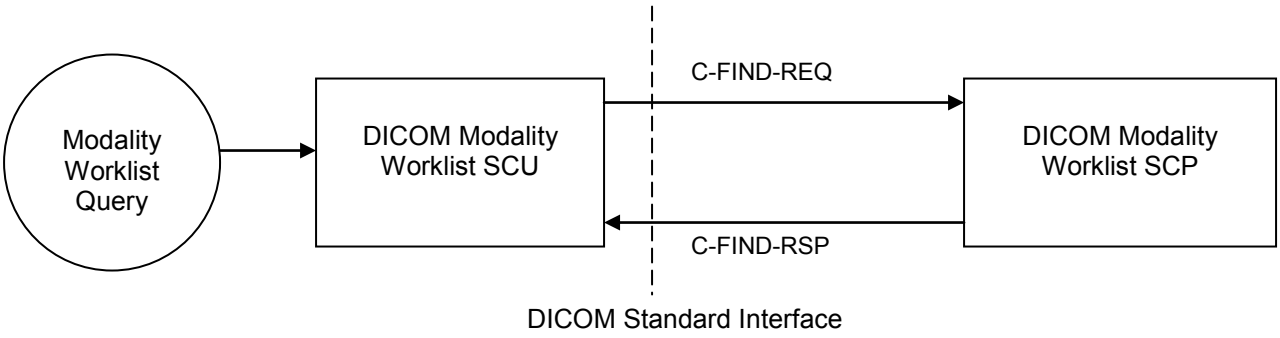

Figure 4-5. Modality Worklist Model

The following data fields will be populated on the worklist screen for each return:

Table 4-1:
Displayed Worklist Return Values

Attribute Name	Tag
Patient Name	(0010,0010)
Patient ID	(0010,0020)
Patient Birth Date	(0010,0030)
Patient Sex	(0010,0040)

The user can view the received MWL data by selecting a study from the picklist and pressing the Details button.

An exam can be selected from the picklist by selecting it then pressing the Create button. By doing so, the New Patient Page will be displayed with all MWL data received for the selected study populating the fields.

The following data fields will be populated on the New Patient Data Screen:

Table 4-2:
Freestyle New Patient Screen Parameters Populated From Worklist Return Values

Attribute Name	Tag
Patient Name	(0010,0010)
Patient ID	(0010,0020)
Patient Birth Date	(0010,0030)
Patient Sex	(0010,0040)
Height	(0010,1020)
Weight	(0010,1030)
Accession	(0008,0050)
Diagnosis	(0008,1080)
Physician	(0008,1050)
Operator	(0008,1070)
Comments	(0032,4000)

4.1.5 Removable Media Storage

The Freestyle can perform DICOM C-STORE operations to USB attached media, such as a USB flash drive. The Freestyle performs the File Set Creator and File Set Updater Roles for USB attached storage. The ACUSON Freestyle has the capability to create the Basic Directory IOD (DICOMDIR) on the USB attached media.

4.2 AE Functional Descriptions

4.2.1 Verification Real-World Activities

The ACUSON Freestyle application entity performs Verification Service Class as an SCU and SCP allowing the operator to verify the ability of an application on a remote device to receive DICOM messages and allowing the operator of a remote DICOM device to verify the ACUSON Freestyle system's ability to receive DICOM messages. (C-ECHO DIMSE)

4.2.2 Store Real-World Activities

The ACUSON Freestyle Application Entity (AE) performs all of the functions to transmit ultrasound images and associated data to network servers and / or workstations. The ACUSON Freestyle AE supports the Ultrasound Image and Ultrasound Multi-Frame Image storage SOP classes as an SCU. Note that the following SOP Classes are **not supported** by the ACUSON Freestyle:

- Retired Ultrasound Image (1.2.840.10008.5.1.4.1.1.6)
- Retired Ultrasound Multi-Frame Image (1.2.840.10008.5.1.4.1.1.3)
- Secondary Capture (1.2.840.10008.5.1.4.1.1.7)

The ACUSON Freestyle AE initiates a single association for C-STORE Requests to a C-STORE SCP when the user invokes a networked DICOM Export from the Study List Page. The association may be used to store multiple single frame images and multi-frame images (clips) contained within a single study.

4.2.3 Storage Commitment Real-World Activities

The Freestyle AE supports the Storage Commitment Push Model SOP class to inform servers when all the store operations for a study have been completed, if the Storage and Storage Commitment SCPs have been properly configured on the Freestyle (see section 4.1.3). The Storage Commitment SCU uses the N-ACTION primitive to request safekeeping of a set of SOP Instances (Ultrasound Images). The Storage Commitment SCU also processes the N-EVENT-REPORT primitives that are received from the SCP indicating 'successful' or 'non-successful' commitment status.

4.2.4 Modality Worklist Real-World Activites

The ACUSON Freestyle AE supports the DICOM Basic Worklist Management Service as an SCU. The AE initiates an association to the selected Worklist server when a Worklist query is selected (via the "Query" button). The association is closed upon the completion of each query. A preset number of maximum matching results are accepted, at which point, the ACUSON Freestyle AE issues a C-FIND-CANCEL request.

4.2.5 Removable Media Storage Real-World Activities

The ACUSON Freestyle AE supports DICOM Store to USB attached media. A DICOMDIR is written or updated at the completion of each operation.

5 AE SPECIFICATIONS

The following specifications apply to the ACUSON Freestyle AE as depicted in Figure 4-1.

5.1 ACUSON Freestyle AE Specification

The ACUSON Freestyle AE provides conformance to the following DICOM Service SOP Classes as an SCU. Additionally, the ACUSON Freestyle AE provides conformance to Verification SOP Class as SCP.

Table 5-1:
Supported SOP Classes

Service SOP Class Name	SOP Class UID
Verification	1.2.840.10008.1.1
Ultrasound Image Storage	1.2.840.10008.5.1.4.1.1.6.1
Ultrasound Multi-Frame Image Storage	1.2.840.10008.5.1.4.1.1.3.1
Storage Commitment	1.2.840.10008.1.20.1
Modality Worklist Information Model C-FIND	1.2.840.10008.5.1.4.31

5.1.1 Association Establishment Policies

5.1.1.1 General

The ACUSON Freestyle system utilizes TCP/IP. The Maximum Length PDU negotiation is included in all association establishment requests. The default PDU length is 4096.

5.1.1.2 Association Establishment Order

The ACUSON Freestyle initiates each C-STORE Request serially, for each study transfer request being processed.

Ultrasound Image and Ultrasound Multi-Frame Image storage associations are established when the export begins. The export function will select the proper association based on the type of image being exported.

5.1.1.3 Asynchronous Nature

All associations use the default synchronous mode of operation. Asynchronous Operations Window negotiations are not supported on the ACUSON Freestyle system.

5.1.1.4 Implementation Identifying Information

- Implementation Class UID: 1.3.2.12.2.1107.5.5.16
- Implementation Version Name: VA30A

5.1.2 Association Initiation by Real-World Activities

5.1.2.1 Real World Activity – Verification

The ACUSON Freestyle is capable of supporting the Verification service class as an SCU or SCP. Verification can be initiated as a singular event from the DICOM PACS, DICOM Storage Commitment or DICOM Modality Worklist Server settings pages.

Proposed Presentation Context – Verification

The ACUSON Freestyle will propose Presentation Contexts as shown in Table 5-2.

Table 5-2:
Verification Presentation Context

Abstract Syntax		Transfer Syntax		Role	Extended Negotiation
Name	UID	Name List	UID List		
Verification	1.2.840.10008.1.1	Implicit VR Little Endian	1.2.840.10008.1.2	SCU/SCP	None

5.1.2.2 Real World Activity – Store

When images are transferred from internal storage to a DICOM Store SCP, the system establishes an association between the Freestyle AE and the configured DICOM device (i.e. Network Archive Server, Workstation Server). The association may be used to store multiple images and clips and is closed when the study transfer is complete.

Proposed Presentation Context – Store

The following Presentation Contexts are presented to the SCP in an Associate request for DIMSE C-STORE storage services. The storage services utilize C-STORE services, as defined by the DICOM Standard. Table 5-3 represents all “Store” Real World Activities.

Table 5-3:
Store Presentation Context

Abstract Syntax		Transfer Syntax		Role	Extended Negotiation
Name	UID	Name List	UID List		
Ultrasound Image Storage	1.2.840.10008.5.1.4.1.1.6.1	Lossy JPEG 8 Bit Image Compression	1.2.840.10008.1.2.4.50	SCU	None
Ultrasound Multi-Frame Image Storage	1.2.840.10008.5.1.4.1.1.3.1	Lossy JPEG 8 Bit Image Compression	1.2.840.10008.1.2.4.50	SCU	None

The ACUSON Freestyle system always acts as an SCU and is the client in a client-server model.

SOP Specific Conformance to Storage Service SOP Classes

The Store Real World Activity provides standard conformance as an SCU for the following standard Storage Service Class SOP:

Table 5-4:
Supported Storage Service SOP Classes

Service SOP Class Name	SOP Class UID	Conformance Level
Ultrasound Image Storage	1.2.840.10008.5.1.4.1.1.6.1	Standard
Ultrasound Multi-Frame Image Storage	1.2.840.10008.5.1.4.1.1.3.1	Standard

This is accomplished using the DIMSE C-STORE Service. The SCU issues a service request with a SOP instance that meets the requirements of the desired ultrasound IOD.

The following table denotes the attributes included in the Ultrasound Image Object as implemented on the ACUSON Freestyle. Attributes not listed are not used.

Table 5-5:
US Image IOD Attributes

Module	Attribute	Tag	Notes
Patient Identification	Patient Name	(0010,0010)	From New Patient/Study Screen or MWL
	Patient ID	(0010,0020)	From New Patient/Study Screen or MWL
	Other Patient Ids	(0010,1000)	From MWL
	Other Patient Names	(0010,1001)	From MWL
Patient	Referenced Patient Sequence	(0008,1120)	From MWL
	Patient Comments	(0010,4000)	From MWL
Patient Demographic	Patient Birth Date	(0010,0030)	From New Patient/Study Screen or MWL
	Patient Sex	(0010,0040)	From New Patient/Study Screen or MWL
	Patient Age	(0010,1010)	From MWL
	Patient Size	(0010,1020)	From New Patient/Study Screen or MWL
	Patient Weight	(0010,1030)	From New Patient/Study Screen or MWL
	Patient Address	(0010,1040)	From MWL
	Military Rank	(0010,1080)	From MWL
	Branch Of Service	(0010,1081)	From MWL
	Ethnic Group	(0010,2160)	From MWL
Patient Study	Admitting Diagnosis Description	(0008,1080)	From New Patient/Study Screen or MWL
Patient Medical	Additional Patient History	(0010,21B0)	From MWL
	Medical Alert	(0010,2000)	From MWL
	Allergies	(0010,2160)	From MWL
	Smoking Status	(0010,21A0)	From MWL
	Additional Patient History	(0010,21B0)	From MWL
	Pregnancy Status	(0010,21C0)	From MWL
	Last Menstrual Date	(0010,21D0)	From MWL
	Special Needs	(0038,0050)	From MWL
	Patient State	(0038,0500)	From MWL
General Study	Study Instance UID	(0020,000D)	Internally generated or from MWL
	Image Type	(0008,0008)	ORIGINAL/PRIMARY
	Study Date	(0008,0020)	Date of study creation or from MWL
	Study Time	(0008,0030)	Time of study creation
	Referring Physician's Name	(0008,0090)	From MWL
	Study ID	(0020,0010)	Internally generated
	Accession Number	(0008,0050)	From New Patient/Study Screen or MWL
	Study Description	(0008,1030)	From New Patient/Study Screen or MWL
	Performing Physician Name	(0008,1050)	From New Patient/Study Screen or MWL
	Referenced Study Sequence	(0008,1110)	From MWL
Study Classification Module	Study Comments	(0032,4000)	From New Patient/Study Screen or MWL
General Series	Modality	(0008,0060)	US
	Operator's Name	(0008,1070)	From New Patient/Study Screen or MWL
	Series Instance UID	(0020,000E)	Internally generated or from MWL
	Series Number	(0020,0011)	Internally generated

Module	Attribute	Tag	Notes
Imaging Service Request	Requesting Physician	(0032,1032)	From MWL
	Requesting Service	(0032,1033)	From MWL
	Admission ID	(0038,0010)	From MWL
	Issue Date of Imaging Request	(0040,2004)	From MWL
	Issue Time of Imaging Request	(0040,2005)	From MWL
	Order Entered By	(0040,2008)	From MWL
	Order Enterer Location	(0040,2009)	From MWL
	Order Callback Phone Number	(0040,2010)	From MWL
	Placer Order Number / Imaging Service Request	(0040,2016)	From MWL
	Filler Order Number / Imaging Service Request	(0040,2017)	From MWL
	Imaging Service Request Comments	(0040,2400)	From MWL
Requested Procedure	Requested Procedure Description	(0032,1060)	From MWL
	Requested Procedure Code Sequence	(0032,1064)	From MWL
	Requested Procedure ID	(0040,1001)	From MWL
	Reason For Requested Procedure	(0040,1002)	From MWL
	Requested Procedure Priority	(0040,1003)	From MWL
	Patient Transport Arrangements	(0040,1004)	From MWL
	Confidentiality Code	(0040,1008)	From MWL
	Reporting Priority	(0040,1009)	From MWL
	Names Of Intended Recipients	(0040,1010)	From MWL
	Requested Procedure Comments	(0040,1400)	From MWL
Visit Status	Current Patient Location	(0038,0300)	From MWL
Scheduled Procedure Step	Requested Contrast Agent	(0032,1070)	From MWL
	Scheduled Procedure Sequence	(0040,0100)	From MWL
General Equipment	Manufacturer	(0008,0070)	Set to SIEMENS
	Institution Name	(0008,0080)	From New Patient/Study Screen
	Institution Address	(0008,0081)	From MWL
	Manufacturer's Model Name	(0008,1090)	Set to "ACUSON Freestyle"
	Device Serial Number	(0018,1000)	Set to system serial number
	Station Name	(0008,1010)	Set to system Application Entity Title
	Software Version	(0018,1020)	Set to VA30A
General Image	Image Date	(0008,0023)	Date of image creation
	Image Time	(0008,0033)	Time of image creation
	Image Number	(0020,0013)	Image number in study (1-n)
Image Pixel	Samples Per Pixel	(0028,0002)	Always set to 3
	Rows	(0028,0010)	Always set to 656
	Columns	(0028,0011)	Always set to 800
	Bits Allocated	(0028,0100)	Always set to 8
	Bits Stored	(0028,0101)	Always set to 8
	High Bit	(0028,0102)	Always set to 7
	Pixel Data	(7FE0,0010)	
	Planar Configuration	(0028,0006)	0

Module	Attribute	Tag	Notes
	Photometric Interpretation	(0028,0004)	YBR_FULL_422
	Pixel Representation	(0028,0103)	0, Pixel representation of unsigned integer
SOP Common	Specific Character Set	(0008,0005)	
	SOP Class UID	(0008,0016)	1.2.840.10008.5.1.4.1.1.6.1
	SOP Instance UID	(0008,0018)	Internally generated
US Region Calibration	Sequence of Ultrasound Regions	(0018,6011)	One for each US region displayed
	>Region Location Min x0	(0018,6018)	
	>Region Location Min y0	(0018,601A)	
	>Region Location Max x1	(0018,601C)	
	>Region Location Max y1	(0018,601E)	
	>Physical Units X Direction	(0018,6024)	Always set to 3, Centimeters
	>Physical Units Y Direction	(0018,6026)	Always set to 3, Centimeters
	>Physical Delta X	(0018,602C)	
	>Physical Delta Y	(0018,602E)	
	>Region Spatial Format	(0018,6012)	Always set to 1, B-Mode (Tissue or Color)
	>Region Data Type	(0018,6014)	B-Mode, Structure only = 1 B Mode, with Color = 2
	>Region Flags	(0018,6016)	Always set to 2, indicating that the images are automatically scaled
US Image Module	Transducer Type	(0018,6031)	LINEAR or CURVED LINEAR
	Lossy Image Compression	(0028,2110)	1

The following table denotes the attributes included in the Ultrasound Multi-Frame Image Object as implemented on the ACUSON Freestyle. Attributes not listed are not used.

Table 5-6:
Ultrasound Multi-Frame Image IOD Attributes

Module	Attribute	Tag	Notes
Patient Identification	Patient Name	(0010,0010)	From New Patient/Study Screen or MWL
	Patient ID	(0010,0020)	From New Patient/Study Screen or MWL
	Other Patient IDs	(0010,1000)	From MWL
	Other Patient Names	(0010,1001)	From MWL
Patient	Referenced Patient Sequence	(0008,1120)	From MWL
	Patient Comments	(0010,4000)	From MWL
Patient Demographic	Patient Birth Date	(0010,0030)	From New Patient/Study Screen or MWL
	Patient Sex	(0010,0040)	From New Patient/Study Screen or MWL
	Patient Age	(0010,1010)	From MWL
	Patient Size	(0010,1020)	From New Patient/Study Screen or MWL
	Patient Weight	(0010,1030)	From New Patient/Study Screen or MWL
	Patient Address	(0010,1040)	From MWL
	Military Rank	(0010,1080)	From MWL
	Branch Of Service	(0010,1081)	From MWL
	Ethnic Group	(0010,2160)	From MWL
Patient Study	Admitting Diagnosis Description	(0008,1080)	From New Patient/Study Screen or MWL
Patient Medical	Additional Patient History	(0010,21B0)	From MWL
	Medical Alert	(0010,2000)	From MWL
	Allergies	(0010,2160)	From MWL

Module	Attribute	Tag	Notes
	Smoking Status	(0010,21A0)	From MWL
	Additional Patient History	(0010,21B0)	From MWL
	Pregnancy Status	(0010,21C0)	From MWL
	Last Menstrual Date	(0010,21D0)	From MWL
	Special Needs	(0038,0050)	From MWL
	Patient State	(0038,0500)	From MWL
General Study	Study Instance UID	(0020,000D)	Internally generated or from MWL
	Image Type	(0008,0008)	ORIGINAL/PRIMARY
	Study Date	(0008,0020)	Date of study creation or from MWL
	Study Time	(0008,0030)	Time of study creation
	Referring Physician's Name	(0008,0090)	From MWL
	Study ID	(0020,0010)	Internally generated
	Accession Number	(0008,0050)	From New Patient/Study Screen or MWL
	Study Description	(0008,1030)	From New Patient/Study Screen or MWL
	Performing Physician Name	(0008,1050)	From New Patient/Study Screen or MWL
	Referenced Study Sequence	(0008,1110)	From MWL
Study Classification Module	Study Comments	(0032,4000)	From New Patient/Study Screen or MWL
General Series	Modality	(0008,0060)	US
	Operator's Name	(0008,1070)	From New Patient/Study Screen or MWL
	Series Instance UID	(0020,000E)	Internally Generated or from MWL
	Series Number	(0020,0011)	Internally generated
Imaging Service Request	Requesting Physician	(0032,1032)	From MWL
	Requesting Service	(0032,1033)	From MWL
	Admission ID	(0038,0010)	From MWL
	Issue Date of Imaging Request	(0040,2004)	From MWL
	Issue Time of Imaging Request	(0040,2005)	From MWL
	Order Entered By	(0040,2008)	From MWL
	Order Enterer Location	(0040,2009)	From MWL
	Order Callback Phone Number	(0040,2010)	From MWL
	Placer Order Number / Imaging Service Request	(0040,2016)	From MWL
	Filler Order Number / Imaging Service Request	(0040,2017)	From MWL
	Imaging Service Request Comments	(0040,2400)	From MWL
Requested Procedure	Requested Procedure Description	(0032,1060)	From MWL
	Requested Procedure Code Sequence	(0032,1064)	From MWL
	Requested Procedure ID	(0040,1001)	From MWL
	Reason For Requested Procedure	(0040,1002)	From MWL
	Requested Procedure Priority	(0040,1003)	From MWL
	Patient Transport Arrangements	(0040,1004)	From MWL
	Confidentiality Code	(0040,1008)	From MWL
	Reporting Priority	(0040,1009)	From MWL
	Names Of Intended Recipients	(0040,1010)	From MWL

Module	Attribute	Tag	Notes
	Requested Procedure Comments	(0040,1400)	From MWL
Visit Status	Current Patient Location	(0038,0300)	From MWL
Scheduled Procedure Step	Requested Contrast Agent	(0032,1070)	From MWL
	Scheduled Procedure Sequence	(0040,0100)	From MWL
General Equipment	Manufacturer	(0008,0070)	Set to SIEMENS
	Institution Name	(0008,0080)	From MWL or New Patient/Study Screen
	Institution Address	(0008, 0081)	From MWL
	Manufacturer's Model Name	(0008,1090)	Set to "ACUSON Freestyle"
	Device Serial Number	(0018,1000)	Set to system serial number
	Station Name	(0008,1010)	Set to system Application Entity Title
	Software Version	(0018,1020)	Set to VA30A
General Image	Image Date	(0008,0023)	Date of image creation
	Image Time	(0008,0033)	Time of image creation
	Image Number	(0020,0013)	Image number in study (1-n)
Image Pixel	Samples Per Pixel	(0028,0002)	Always set to 3
	Rows	(0028,0010)	Always set to 656
	Columns	(0028,0011)	Always set to 800
	Bits Allocated	(0028,0100)	Always set to 8
	Bits Stored	(0028,0101)	Always set to 8
	High Bit	(0028,0102)	Always set to 7
	Pixel Data	(7FE0,0010)	
	Planar Configuration	(0028,0006)	Always set to 0
	Photometric Interpretation	(0028,0004)	YBR_FULL_422
	Pixel Representation	(0028,0103)	Always set to 0
Cine Module	Frame Time	(0018,1063)	
Multi-Frame	Number Of Frames	(0028,0008)	
	Frame Increment Pointer	(0028,0009)	Set to (0018, 1063)
SOP Common	Specific Character Set	(0008,0005)	From MWL
	SOP Class UID	(0008,0016)	1.2.840.10008.5.1.4.1.1.3.1
	SOP Instance UID	(0008,0018)	Internally generated
	Specific Character Set	(0008,0005)	
US Region Calibration	Sequence of Ultrasound Regions	(0018,6011)	One for each US region displayed
	>Region Location Min x0	(0018,6018)	
	>Region Location Min y0	(0018,601A)	
	>Region Location Max x1	(0018,601C)	
	>Region Location Max y1	(0018,601E)	
	>Physical Units X Direction	(0018,6024)	Always set to 3, Centimeters
	>Physical Units Y Direction	(0018,6026)	Always set to 3, Centimeters
	>Physical Delta X	(0018,602C)	
	>Physical Delta Y	(0018,602E)	
	>Region Spatial Format	(0018,6012)	Always set to 1, B-Mode (Tissue or Color)
	>Region Data Type	(0018,6014)	B-Mode, Structure only = 1 B Mode, with Color = 2
	>Region Flags	(0018,6016)	Always set to 2, indicating that the images are automatically scaled

Module	Attribute	Tag	Notes
US Image Module	Transducer Type	(0018,6031)	LINEAR or CURVED LINEAR
	Image Type	(0008,0008)	ORIGINAL\PRIMARY
	Lossy Image Compression	(0028,2110)	1

Error Handling

Should an error occur during the export process, an error message will be displayed in the Status column on the Export Page.

5.1.2.3 Real-World Activity – Storage Commitment

One or more Storage Commitment SCPs must be configured in the Settings – DICOM – Storage Commitment page. When a study is exported, the desired Storage Commitment SCP can be selected. The Freestyle will automatically attempt to send a Storage Commitment request for the images in an exported study once the C-STORE operations are complete.

Proposed Presentation Context – Send Storage Commitment Request

The Freestyle Storage Commitment AE will propose Presentation Contexts as shown in the following table:

Table 5-7:
Storage Commitment Request Presentation Context

Abstract Syntax		Transfer Syntax		Role	Extended Negotiation
Name	UID	Name List	UID List		
Storage Commitment Push	1.2.840.10008.1.20.1	DICOM Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None

One Storage Commitment request is sent for all images in the study immediately after the study is sent. This request is contained in the N-ACTION-RQ message. Once this message is sent, the association is kept open while waiting for the N-ACTION-RSP response. Once the N-ACTION-RSP is received, the association is closed. When the Storage Commitment SCP has determined the status of the requested images, it will use the N-EVENT-REPORT to send the commitment status of the images back to the SCU.

Storage Commitment is supported for all the Storage SOP Class UIDs as listed in Table 5-1.

SOP Specific Conformance to Storage Commitment Service SOP Classes

The Storage Commitment AE provides standard conformance as an SCU for the following standard Storage Service Class SOP:

Table 5-8:
Supported Storage Commitment SOP Classes

Service SOP Class Name	SOP Class UID	Conformance Level
Storage Commitment Push	1.2.840.10008.1.20.1	Standard

This is accomplished using the DIMSE N-ACTION Service. The SCU issues a service request with a SOP instance that meets the requirements of the desired ultrasound IOD.

The following table denotes the attributes included in the Storage Commitment Request Object (N-ACTION-RQ) as implemented on the ACUSON Freestyle. Attributes not listed are not used.

Table 5-9:
Storage Commitment Request Attributes

Module	Attribute	Tag	Notes
Storage Commitment Module	Transaction UID	(0008,1195)	Internally Generated
	Reference SOP Sequence	(0008,1199)	Sequence of all images in the study
	>Referenced SOP Class UID	(0008,1150)	SOP Class UID of image n in the study
	>Referenced SOP Instance UID	(0008,1155)	SOP Instance UID of image n in the study

The following table denotes the attributes included in the Storage Commitment Response (N-EVENT-REPORT) as implemented on the ACUSON Freestyle. Attributes not listed are not used.

Table 5-10:
Storage Commitment Response Attributes

Module	Attribute	Tag	Notes
Storage Commitment Module	Transaction UID	(0008,1195)	Internally Generated
	Reference SOP Sequence	(0008,1199)	Sequence of all images that were successfully stored
	>Referenced SOP Class UID	(0008,1150)	SOP Class UID of image n that was successfully stored
	>Referenced SOP Instance UID	(0008,1155)	SOP Instance UID of image n that was successfully stored
	Failed SOP Sequence	(0008,1998)	Sequence of all images that were not successfully stored
	>Referenced SOP Class UID	(0008,1150)	SOP Instance UID of image m that was not successfully stored
	>Referenced SOP Instance UID	(0008,1155)	SOP Instance UID of image m that was not successfully stored

5.1.2.4 Real World Activity – Modality Worklist

The Modality Worklist SCU requests that the remote SCP performs a match of all keys specified in the query against the information in its worklist database. The Freestyle system provides Standard Conformance to the following DICOM V3.0 SOP Class as an SCU:

Proposed Presentation Context – Send Modality Worklist

The Freestyle Modality Worklist AE will propose Presentation Contexts as shown in the following table:

Table 5-11:
Modality Worklist Presentation Context

Abstract Syntax		Transfer Syntax		Role	Extended Negotiation
Name	UID	Name List	UID List		
Modality Worklist Information Model - FIND	1.2.840.10008.5.1.4.31	DICOM Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None

SOP Specific Conformance to Modality Worklist Service SOP Classes

The Modality Worklist AE provides standard conformance as an SCU for the following standard Storage Service Class SOP:

Table 5-12:
Supported Modality Worklist SOP Classes

Service SOP Class Name	SOP Class UID	Conformance Level
Modality Worklist Information Model - FIND	1.2.840.10008.5.1.4.31	Standard

The following table provides the list of attributes requested in the Modality Worklist Query.

Table 5-13:
Modality Worklist Query Attributes

Attribute Name	Tag
Specific Character Set	(0008,0005)
Accession Number	(0008,0050)*
Modality	(0008,0060)*
Institution Name	(0008,0080)
Institution Address	(0008,0081)
Referring Physician's Name	(0008.0090)
Study Description	(0008,1030)
Performing Physician's Name	(0008,1050)
Admitting Diagnosis	(0008,1080)
Referenced Study Sequence	(0008,1110)
>Referenced SOP Class UID	(0008,1150)
>Reference SOP Instance UID	(0008,1155)
Referenced Patient Sequence	(0008,1120)
>Referenced SOP Class UID	(0008,1150)
>Referenced SOP Instance UID	(0008,1155)
Patient Name (Last, First)	(0010,0010)*
Patient ID	(0010,0020)*
Patient Birthdate	(0010,0030)
Patient Sex	(0010,0040)*
Other Patient IDs	(0010,1000)
Other Patient Names	(0010,1001)
Patient Age	(0010,1010)
Patient Size (Height)	(0010,1020)
Patient Weight	(0010,1030)
Patient Address	(0010,1040)
Military Rank	(0010,1080)
Branch Of Service	(0010,1081)
Medical Alert	(0010,2000)
Allergies	(0010,2110)
Ethnic Group	(0010,2160)
Smoking Status	(0010,21A0)
Additional Patient History	(0010,21B0)
Pregnancy Status	(0010,21C0)
Last Menstrual Date	(0010,21D0)
Patient Comments	(0010,4000)
Study Instance UID	(0020,000D)
Series Instance UID	(0020,000E)

Attribute Name	Tag
Requesting Physician	(0032,1032)
Requesting Service	(0032,1033)
Requested Procedure Description	(0032,1060)
Requested Procedure Code Sequence	(0032,1064)
>Code Value	(0008,0100)
>Coding Scheme Designator	(0008,0102)
>Coding Scheme Version	(0008,0103)
>Code Meaning	(0008,0104)
Requested Contrast Agent	(0032,1070)
Admission ID	(0038,0010)
Issuer of Admission ID	(0038,0011)
Special Needs	(0038,0050)
Current Patient Location	(0038,0300)
Patient State	(0038,0500)
Scheduled Procedure Sequence	(0040,0100)
>Modality Element	(0008,0060)
>Requested Contrast Agent	(0032,1070)
>Scheduled Station AE Title	(0040,0001)
>Scheduled Procedure Start Date	(0040,0002)*
>Schedule Procedure Start Time	(0040,0003)
>Scheduled Physician Name	(0040,0006)
>Scheduled Procedure Description	(0040,0007)
>Scheduled Protocol Code Sequence	(0040,0008)
>>Code Value	(0008,0100)
>>Coding Scheme Designator	(0008,0102)
>>Coding Scheme Version	(0008,0103)
>>Code Meaning	(0008,0104)
>Scheduled Procedure Step ID	(0040,0009)
>Scheduled Station Name	(0040,0010)
>Scheduled Procedure Step Location	(0040,0011)
>Pre Medication	(0040,0012)
>Scheduled Procedure Step Status	(0040,0020)
>Scheduled Procedure Step Comments	(0040,0400)
Requested Procedure ID	(0040,1001)
Reason For Requested Procedure	(0040,1002)
Requested Procedure Priority	(0040,1003)
Patient Transport Arrangements	(0040,1004)
Confidentiality Code	(0040,1008)
Reporting Priority	(0040,1009)
Names of Intended Recipients	(0040,1010)
Requested Procedure Comments	(0040,1400)
Issue Date of Imaging Request	(0040,2004)
Issue Time of Imaging Request	(0040,2005)
Order Entered By	(0040,2008)
Order Enterer Location	(0040,2009)

Attribute Name	Tag
Order Callback Phone Number	(0040,2010)
Placer Order Number / Imaging Service Request	(0040,2016)
Filler Order Number / Imaging Service Request	(0040,2017)
Imaging Service Request Comments	(0040,2400)

* indicates attribute may be populated for query

6 REMOVABLE INTERCHANGE MEDIA SPECIFICATIONS

This implementation supports USB Connected Removable Devices. It conforms the Application Profile General Purpose USB Media Interchange with JPEG (STD-GEN-USB-JPEG).

Limitations:

- Studies from the Freestyle system and other DICOM File Set Creators should not be mixed on a single USB device.
- Saved DICOM studies cannot be opened for review on the Freestyle system.
- Saved Freestyle system DICOM studies cannot be opened for review from a USB Device on other Siemens ultrasound systems.

6.1 Supported SOP Classes

The Freestyle system supports standard conformance to the following DICOM SOP classes:

Table 6-1:
Supported Media Storage SOP Classes

Abstract Syntax		Role
Name	**UID**	
Ultrasound Image Storage	1.2.840.10008.5.1.4.1.1.6.1	FSC
Ultrasound Multi-Frame Image Storage	1.2.840.10008.5.1.4.1.1.3.1	FSC
Directory Storage	1.2.840.10008.1.3.10	FSC, FSU

6.2 Proposed Interchange Media Transfer Syntaxes

The Transfer Syntax used with the Ultrasound Image Storage and Multi-Frame Image Storage SOP classes will be JPEG Baseline, with Explicit VR Little Endian encoding. The Directory Storage SOP class will always use Explicit VR Little Endian encoding.

Table 6-2:
Proposed Transfer Syntaxes for Interchange Media

Abstract Syntax		Selected Compression	Transfer Syntax	
Name	**UID**		**Name**	**UID List**
Ultrasound Image Storage	1.2.840.10008.5.1.4.1.1.6.1	JPEG	Explicit VR, JPEG baseline	1.2.840.10008.1.2.4.50
Ultrasound Multi-Frame Image Storage	1.2.840.10008.5.1.4.1.1.3.1	JPEG	Explicit VR, JPEG baseline	1.2.840.10008.1.2.4.50
Directory Storage	1.2.840.10008.1.3.10	any	Explicit VR, Little Endian	1.2.840.10008.1.2.1

6.3 Physical Storage Media and Format

The physical storage media are USB Connected Removable Devices of various capacities. The media uses the FAT32 file system.

7 COMMUNICATION PROFILES

All ACUSON Freestyle system application entities utilize the DICOM 3.0 TCP/IP communication support as defined in PS3.8 (Part 8) of the DICOM 3.0 Standard.

7.1 TCP/IP Stack Supported

Each process inherits its TCP/IP stack from the ACUSON Freestyle operating system's TCP/IP stack.

7.1.1 Physical Media Supported

Standard representations of IEEE 802.3 10BaseT/100BaseT ("twisted pair") are supported.

8 EXTENSIONS/SPECIALIZATIONS/PRIVATIZATIONS

No private elements or private transfer syntaxes are used by the ACUSON Freestyle AE.

9 CONFIGURATION

ACUSON Freestyle Networking and DICOM parameters can be configured through the ACUSON Freestyle Setup menu screens. The following DICOM-related setup screens are supported:

- Network Identification
- Freestyle DICOM Information
- DICOM PACS Information
- DICOM Storage Commitment Server Information
- DICOM Modality Worklist Server Information

The Freestyle supports Port Numbers up to 65535 on all configuration pages.

9.1 Network Identification

The Network Identification Setup Screen allows the user to configure the local Network Parameters for both wired and wireless configurations. The following parameters are configurable for the ACUSON Freestyle system:

- IP Address
- Subnet Mask
- Default Gateway
- Auto IP (DHCP) checkbox
- Wireless security settings

9.2 Freestyle DICOM Information

The Freestyle DICOM Information setup screen allows the user to configure the Freestyle DICOM Application Entity. The following parameters are configurable for the ACUSON Freestyle system:

- Freestyle AE Title
- Freestyle AE Port Number (default is 104)

9.3 DICOM PACS Information

The Freestyle DICOM Server setup screen allows the user to configure up to 8 DICOM Servers (C-Store SCPs). The following parameters are configurable for the ACUSON Freestyle system:

- DICOM Server Alias
- DICOM Server AE Title
- DICOM Server IP Address
- DICOM Server Port Number

Ping and DICOM Verify (C-ECHO) tests can be run by selecting the desired SCP, then pressing the Edit button, which displays a dialog with the selected SCP's information. By pressing the Test button, the Ping or DICOM Verify test can be selected.

9.4 DICOM Storage Commitment Server Information

The Freestyle Storage Commitment Server Setup screen allows the user to configure up to 8 Storage Commitment Servers. The following parameters are configuratble for the ACUSON Freestyle system:

- Modality Worklist Server Alias
- Modality Worklist Server AE Title
- Modality Worklist Server IP Address
- Modality Worklist Server Port Number

Ping and DICOM Verify (C-ECHO) tests can be run by selecting the desired SCP, then pressing the Edit button, which displays a dialog with the selected SCP's information. By pressing the Test button, the Ping or DICOM Verify test can be selected.

9.5 Modality Worklist Server Information

The Freestyle Modality Worklist Server Setup screen allows the user to configure up to 8 Modality Worklist Servers. The following parameters are configurable for the ACUSON Freestyle system:

- Modality Worklist Server Alias
- Modality Worklist Server AE Title
- Modality Worklist Server IP Address
- Modality Worklist Server Port Number

Ping and DICOM Verify (C-ECHO) tests can be run by selecting the desired SCP, then pressing the Edit button, which displays a dialog with the selected SCP's information. By pressing the Test button, the Ping or DICOM Verify test can be selected.

The desired Worklist Server and the maximum number of returns per query are configurable from the Modality Worklist Query page.

9.6 Support of Extended Character Sets

The “ISO-IR 100” Latin Alphabet 1 Extended character set is supported by the ACUSON Freestyle system.